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Notes on insect infestation in seed of Acacia caffra (Thunb.) Willd. in Natal

by

J. H. Ross

(Bews Botanical Laboratories, University of Natal, Pietermaritzburg)

SYNOPSIS

Seeds of *Acacia caffra* in Natal are attacked by *Enaretta castelnaudi* Thoms. (Cerambycidae), *Laspeyresia campestris* Meyr. (Olethreutidae) and *Bruchus* (*Bruchidius*) *silaceus* Fahr. (Bruchidae). In two areas 15·7—35·2% of the seed was found to be infested. These insects seem to play a major role in preventing grassland encroachment by *Acacia caffra.*

INTRODUCTION

The genus *Acacia* is one of the most widespread and important in Africa. Its species are dominant over extensive tracts of land, especially in tropical and subtropical areas, and in South Africa, at least, are of economic significance from the aspect of encroachment into grassland grazing areas.

During a field study of *A. caffra* (Thunb.) Willd. and other species, attention was drawn to the great wealth of insect life associated with the genus. Perhaps no plants in semi-arid environments have so many insects associated with them and, to a certain extent, adapted to them as do various species of *Acacia.* The wattle bagworm *Kotochalia junodi* (Heyl.), which occurs occasionally on *A. caffra*, and the caterpillars of various moths, feed on and destroy the leaves. Scale insects occur on the twigs. The bark and woody tissues are invariably riddled with the holes and tunnels of woodboring beetles while the flowers are visited by numerous species of bees, wasps, flies and various kinds of Hemiptera. Indirectly associated with *A. caffra* are many kinds of entomophagous insects, and others which are parasitic on the phytophagous species.

It was observed that insects are voracious consumers of the seed. Consequently it was decided to ascertain the role played by these insects and to explore the possibility of insects being used as a biological means of controlling the encroachment of *Acacia* species into grasslands.

DISTRIBUTION OF *A. caffra* IN NATAL

A. caffra is widespread in Natal, extending from Zululand in the north to the Cape border in the south, and inland from the coast to an altitude of approximately 5000 feet at Oliviers Hoek Pass and Van Reenen's Pass on the Low Drakensberg. The species occurs commonly on dolerite-capped ridges and koppies, and on soils derived from the sedimentary Beaufort and Ecca Series.

POD FORMATION

Pods, which vary from one to eight to a peduncle, begin forming towards the end of October and generally ripen from March to July. Ripening is irregular, pods of different ages sometimes occurring on the same peduncle. The pod is usually slightly constricted between each seed so that seeds tend to lie in separate compartments. Mature pods dehisce longitudinally along one or both margins while still attached to the peduncle, without seeds being shed (see Fig. 1).

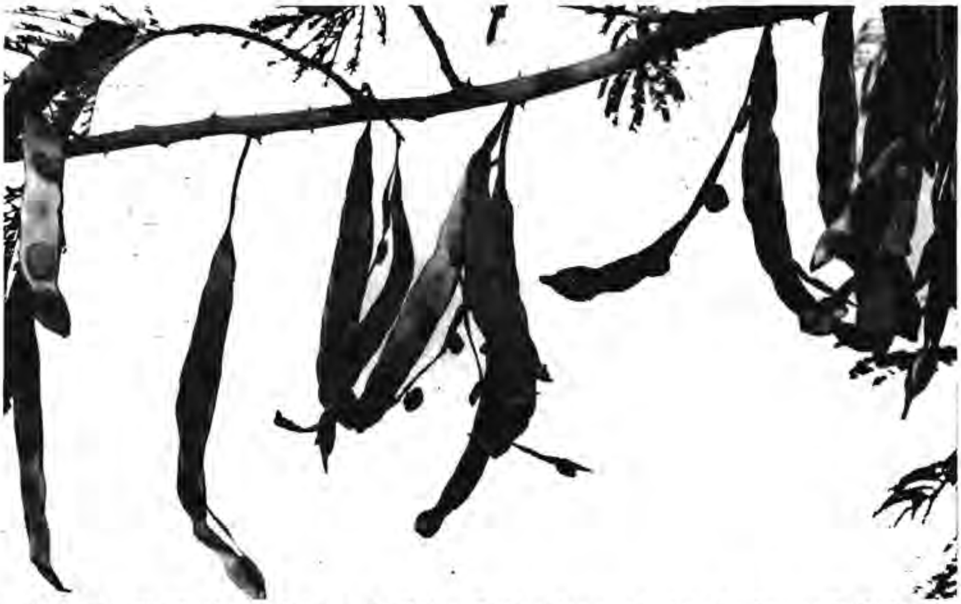

Fig. 1. Longitudinally dehisced ripe pods of *A. caffra* showing attached seeds. Baynes Drift, June 1963.

Seeds lie longitudinally in the pod with the hilum facing away from the pedicel. Sim (1907, Plate LX, Fig. 5) is incorrect in this detail. Each seed is attached to the pericarp by a curly, wiry funicle up to seven millimetres in length.

FAILURE OF POD FORMATION

Failure of pod formation is due to insect attack which results in gall formation. Each ovary of an inflorescence axis may become galled (see Figs. 2 and 3).

Attempts to isolate the insect responsible for the formation of these galls have so far failed, but a small wasp is thought to be involved. Galls have been found in nearly every Natal population of *A. caffra*. Although not observed in the Greytown, Ndumu, Port Edward, Van Reenen and Vryheid populations, it is suspected that galls are also present in these. Similar galls have been observed from the north eastern Cape Province, Swaziland, Transvaal and southern Portuguese East Africa, and thus the insect responsible is represented throughout almost the whole range of *A. caffra* in Africa.

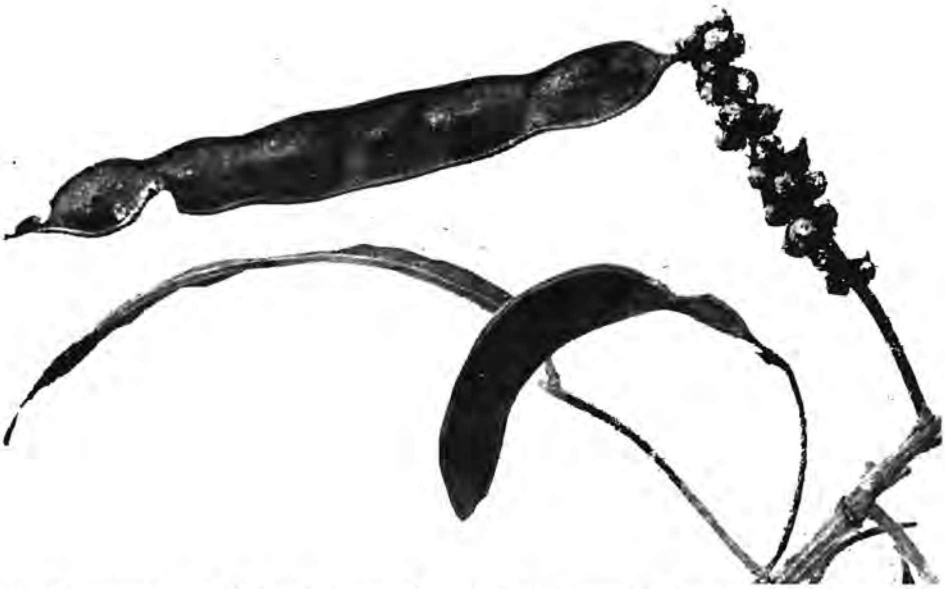

Fig. 2. Inflorescence axis of *A. caffra* showing extensive gall formation resulting from insect infestation of each ovary. Ashburton, June 1963.

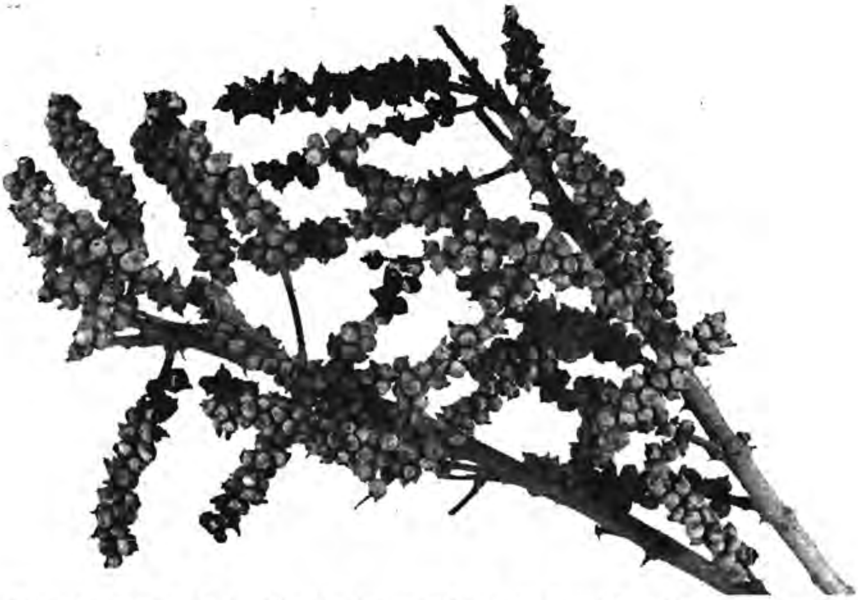

Fig. 3. Flowering branch of *A. caffra* showing complete lack of pod formation. The small aperture in many of the galls indicates from where the responsible insect escapes. Ashburton, June 1963.

SEED PRODUCTION

The number of viable seeds varies from pod to pod on the same tree, from tree to tree within the same population, and from one population to another. Three trees from the Ashburton and three from the Baynes Drift population were completely stripped of pods. Results of pod and seed counts for these trees are shown in Table 1.

TABLE 1. Insect infestation in seed of *A. caffra*

Locality and Tree Number	Height of Tree in feet	Diameter of Trunk at Breast Height in inches	Total Number of Pods per Tree	Total Number of Viable Seeds	Total Number of Infested Seeds	Percentage Infested	Number of Viable Seeds per Pod
Ashburton, 1 ..	12	4.5	0	0	0	—	0
Ashburton, 2 ..	10	3	6	17	5	22·7	3
Ashburton, 3 ..	9	2.5	4,797	10,863	2,017	15·7	2
Baynes Drift, 12 ..	9	2	14,552	33,516	10,751	24·5	2
Baynes Drift, 13 ..	11	3.5	14,722	45,017	12,271	21·4	3
Baynes Drift, 21 ..	8	2	507	1,671	909	35·2	3

The lack of pods on Tree 1, Ashburton, was due to extensive gall formation. Tree 2 suffered a similar but less extensive infestation.

Tree 13, Baynes Drift, carried what was visually estimated as an average crop for the population, there being numerous other trees carrying an apparently equal, or greater, number of pods. This crop of 14,772 pods contained 45,017 viable seeds, an average of 3 per pod. Counts revealed that six was the average number of ovules per pod. Thus the tree had a potential crop of 88,332 seeds. Insects, fungi and failure of fertilisation resulted in the destruction of 43,415 of these before dispersal, that is, almost 50% of the crop. A population of fifty similar trees could therefore produce 4,416,600 seeds in one season. Assuming that insects, fungi and failure of fertilisation would account for almost 50% of these 2,250,850 viable seeds would remain, still a considerable number.

INSECT SPECIES RESPONSIBLE FOR SEED DESTRUCTION

Initially it was thought that a single species of insect was responsible for destruction of the large numbers of seed, but subsequent investigation showed that at least three are involved. One species is replaced in importance by another as the season progresses. Members of two families of beetle, Bruchidae and Cerambycidae, are responsible for destruction of most seed. The third insect is the larva of a moth.

Early in the season the family Cerambycidae is more important. The larva of *Enaretta castelnaudi* Thoms., creamy-white and up to seven millimetres in length, feeds on the immature seeds. A single larva usually destroys only one seed, but observations indicate that a larva may damage every seed in a pod. Owing to larval activity pods are prevented from dehiscing longitudinally when mature. The mature beetle escapes by boring through the pod wall.

Also appearing early in the season are caterpillars of the moth, *Laspeyresia campestris* Meyrick (family Olethreutidae), which are responsible for the destruction of a smaller number of seeds. These caterpillars, creamy-white and up to twelve millimetres in length, feed on the immature seeds. A caterpillar frequently destroys several seeds in a pod. Each caterpillar spins a cocoon and in so doing firmly binds the two pod valves thus preventing dehiscence. The moth eats its way through cocoon and pod wall before escaping.

Weevils, of the family Bruchidae, are responsible for the destruction of as many, if not more, seeds than *Enaretta castelnaudi.* The weevil chiefly involved is *Bruchus* (*Bruchidius*) *silaceus* Fahr., although what is thought to be an undescribed species close to *B. rubicundus* Fahr. was also found. *Bruchus* (*Bruchidius*) *quadrisignatus* Fahr. was recorded from *Acacia brevispica* Harms.

External examination does not reveal that a seed is harbouring a larva. The first indication of the weevil is the appearance of a circular cut in the testa. The circular disc is pushed upwards by the emerging mature weevil. A seed contains a limited food supply, so if several larvae are present within the same seed it is usual for one to develop at the expense of the others. Occasionally, however, two weevils may emerge from a single seed.

In stored seed weevils mate and lay eggs without leaving the container. Breeding continues until all stored seed is completely ruined. Consequently it is essential to treat stored seed with an insecticide which, although not killing insects within the seeds, prevents emerging weevils from mating and destroying further seed.

Among other insects noticed emerging from seeds were tiny wasps of the family Pteromalidae. These were comparatively scarce and only appeared late in the season. The wasps are parasitic on the larvae of *Enaretta castelnaudi.* Story (1952) recorded tiny wasps (Chalcids) which were vegetarian from *A. karroo* Hayne.

Observations suggest that where *A. caffra* is plentiful the insect pests are numerous, so that large populations of trees might produce even fewer seeds than small populations. Gillett (1962) expressed the view that it will always be easier for the pests to attack, and become adapted to, common species. As pests have a relatively short life-cycle, they are able to evolve towards adaptation more rapidly than can the attacked species towards withstanding infestation. The reproductive capacity of common species will consequently be worn down by an ever-growing burden of pests, while scarcer species, especially if new to the area, will, "relatively speaking, escape".

In this account attention has only been paid to those insects which destroy the seeds before they are shed from the plant. Once on the ground, seeds are subject to depredations of yet other insects that further greatly reduce the number of viable seeds. It is likely that less than 5% of seed produced ever germinate. The role played by various insects in destroying so many seeds cannot be over-emphasised, for without them, invasion of grassland areas might well proceed even faster than at present.

SUMMARY

During a field study of *A. caffra* and other species, attention was drawn to the wealth

of insect life associated with the genus. Insects were found to be voracious consumers of seed. Initially it was thought that a single species of insect was responsible for seed destruction, but subsequent investigation revealed that at least three species are important. One species is replaced in importance by another as the season progresses. Observations suggest small populations of *A. caffra* may produce more viable seeds than large populations. The role played by the insects in destroying seeds cannot be over-emphasised for without this destruction the invasion of grasslands by *Acacia* species might well proceed faster than at present.

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